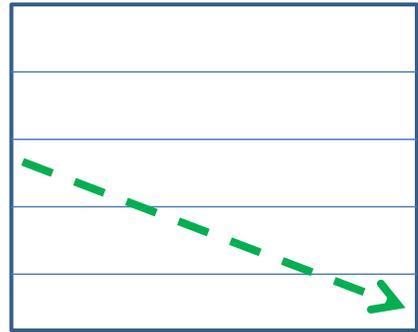
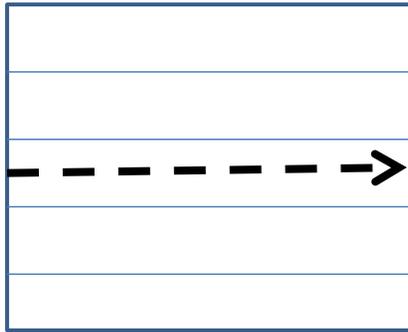
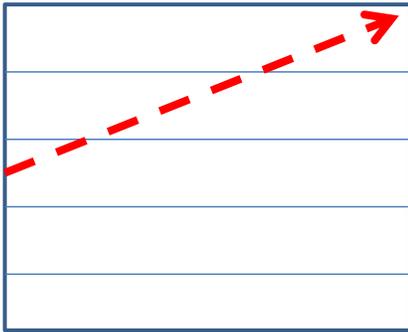




# Progress Report: Region of Waterloo's Corporate GHG Emission Reduction Plan



For submission to:

Federation of Canadian Municipalities - Partners for Climate Protection

Sustainable Waterloo Regional Carbon Initiative

October 2013

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## INTRODUCTION

In May of 2011, Regional Council approved the Greenhouse Gas (GHG) Inventory and Action Plan for corporate operations that are under the Region of Waterloo's responsibility. **The overall goal of the Action Plan is to reduce GHG emissions of operations while continuing to provide high quality community programs and services to a growing population.** This goal will be reached by achieving three main objectives which incorporate the expectation that operations and infrastructure are likely to grow with increased community demand for various programs and services. These objectives address the vast majority of emission sources from Regional operations and are as follows:

1. Optimize the efficient consumption of energy resources within Regional facilities including the use of renewable energy sources where appropriate.  
*Progress indicator: total GHGs from stationary energy use and energy/m2 of building space.*
2. Manage the Regions fleet of vehicles in a manner to achieve improvements in fuel efficiency.  
*Progress indicator: total GHGs from vehicles and fuel consumption per kilometre travelled.*
3. Ensure other Regional operations exploit opportunities to reduce GHG emissions where feasible (e.g. within waste management, wastewater treatment plants and biosolids).  
*Progress indicator: total and per capita GHGs from Regional landfill, WWTP and biosolids.*

The documentation of the Plan included estimated emissions from corporate operations for the base year of 2009, forecasted emissions out to the year 2019, a list of major existing, planned and proposed actions as well as a GHG reduction target. The *absolute* target adopted by Regional Council commits the Region to maintain its corporate emissions at 2009 levels out to 2019 equating to offsetting over 40,000 tonnes of forecasted GHG growth or a 14% per capita *intensity-based* reduction as Waterloo Region's population is anticipated to increase. These absolute and intensity-based commitments were made with respect to the Federation of Canadian Municipalities (FCM) Partners for Climate Protection program (PCP) and the local Sustainable Waterloo Regional Carbon Initiative.

This progress report is being provided for three main reasons:

- to illustrate the results of an improved calculation method for the base year emissions inventory and 10-year forecast which will provide better monitoring/reporting of progress in the future;
- to provide a status update on actions completed to date and those remaining to be implemented, and;
- to propose a new GHG reduction target based on the improved inventory/forecasting method and projected impact of implementing the remaining actions identified within the plan.

This progress report can be submitted to FCM towards the completion of the remaining milestones within their program. The PCP program, supported by approximately 240 municipalities across Canada, is comprised of five milestones that each municipality commits to achieving for both their organizational scope (corporate operations) as well as on a community scale<sup>1</sup>. The five milestones are as follows:

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<sup>1</sup> The community scope is being addressed in collaboration with several local partners. In June 2012, Milestone 1 was achieved and an action plan and proposed reduction target will be presented to Region and area City councils for their consideration in the Fall of 2013 .

1. Creating a greenhouse gas emissions (GHG) inventory and 10 year forecast;
2. Setting emissions reductions target 10 years from the base year;
3. Developing a local action plan;
4. Implementing the local action plan or a set of activities; and
5. Monitoring progress and reporting results.

To date, less than 20 municipalities in Canada have reached milestone 5 since the PCP program started in the mid-to-late 1990's. The Sustainable Waterloo Regional Carbon Initiative is focussed on organizational GHG emission reduction targets and formally recognize pledged commitments to reduce at least 20% of base year emissions (absolute or intensity based targets).

### IMPROVED ACCOUNTING OF GHG EMISSIONS

The initial GHG Emissions Inventory and Forecast was prepared to a level of technical detail that significantly exceeds the requirements of the PCP program and Sustainable Waterloo Regional Carbon Initiative. Over the past year, improvements to the Region's GHG accounting approach used for calculating the Region's emissions from corporate operations include:

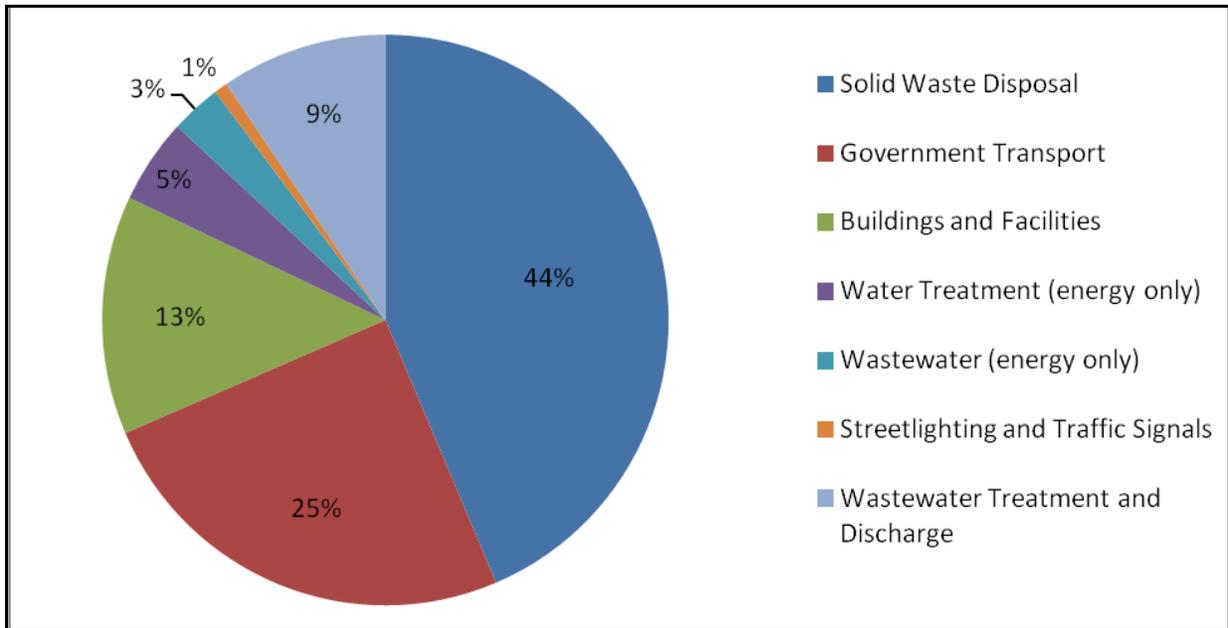
- more accurate estimation of GHG emissions from waste management of the landfill as well as wastewater and biosolids operations;
- elimination of tracking very minor sources of emissions which involve inaccurate estimation methods or are difficult to monitor;
- use of the most recently available emission factors for electricity consumption, and;
- updated population forecasts for calculation of forecasted growth and per capita GHG reduction targets.

The overall impact from this revised reporting of the Region's base year 2009 GHG emissions is less than 1% lower than what was previously reported and less than 5% lower for the 2019 forecasted GHG value. Table 1 provides a simple comparison of this impact (see Appendix A for further details). Benefits of these revisions include improved progress monitoring of implemented actions as they will be better reflected in the new inventory approach and ease of data collection for future inventory reports. Figure 1 includes revised emissions from the Region's corporate operations by major source.

**Table 1. Summary Impact of Changes from Improved Accounting of GHG Emissions**

<i>(GHG Emissions in Tonnes)</i>	Old Values	New Values	% Difference
<b>2009 GHG emissions and current target level</b>	148,140	<b>147,743</b>	- 0.27%
<b>2009 per capita GHG emissions (pop. 534,900)</b>	0.277	<b>0.276</b>	-0.3%
<b>2019 GHG emissions projection</b>	189,306	<b>180,143</b>	- 4.8%
<b>Estimated 2019 population</b>	623,450	<b>631,777</b>	+1.3%
<b>2019 Per Capita GHGs @ if 2009 target is met</b>	0.238	<b>0.234</b>	- 1.7%
<b>Current <i>intensity</i> GHG reduction target from 2009</b>	14%	<b>15%</b>	+1%

**Figure 1. Revised Region of Waterloo Corporate GHG Emissions by Major Source (Year 2009)**



## 2011 EMISSIONS INVENTORY

Using the improved methodology of estimating GHG emissions from operations, a simplified summary of major emission sources can be compared to 2009. Table 2 illustrates that almost 15% of emissions were reduced comparing 2011 inventory figures with the base year 2009 values. This reduction is primarily due to a combination of changes made in the management of solid waste and wastewater treatment and biosolids as well as reductions in energy consumption. The provincial energy mix has also become slightly less carbon intensive (less coal power) which reduces emissions from consumption of grid electricity throughout Ontario.

**Table 2. Comparison of 2009 and 2011 Corporate GHG Emissions from Regional Operations**

Emission Source	2009 GHGs (Tonnes)	2011 GHGs (Tonnes)	Difference
Electricity (Buildings/facilities, streetlights and traffic signals)	17,402	15,802	-9.2%
Natural gas (Buildings/facilities)	15,099	14,262	-5.5%
Fleet Vehicles (incl. Transit and 3 <sup>rd</sup> party waste collection)	36,244	37,550	+3.6%
Staff business travel	550	521	-5.3%
Solid waste (incl. dry biosolids to landfill)	64,428	56,593*	-12.2%
Wastewater treatment / liquid biosolids (non-energy based emissions)	14,020	1,372	-90.2%
<b>Totals</b>	<b>147,743</b>	<b>126,100</b>	<b>-14.6%</b>

\*Note: includes reductions from solar flaring of landfill gas and methane reductions from organic waste diversion.

**ACTION PLAN - SUMMARY UPDATE**

Several actions have been completed or are in progress with a several large initiatives remaining to be implemented. Table 3 provides a summary of the actions completed in the past two years.

**Table 3. Estimated GHG Emission Reductions from RoW Corporate Operations 2010 - 2012**

Initiative / Cost (where applicable/available)	GHG Emissions Reduced per Year	Annual \$ Savings/Revenue
New wastewater treatment operations and biosolids management practices	13,215	NA
Methane destruction at landfill – solar flaring (embedded in base operating budget)	5,974	NA
Methane reduction from landfill via Green Bin Organic Waste diversion (same as above)	5,143	NA
5 LEED Buildings meeting Gold/Silver standards (within construction budgets)	1200	(avg.: 25% - 50% energy savings)
Energy efficiency lighting and HVAC equipment retrofits (\$2 million)	566	\$312,000 energy savings
Rightsizing fleet: smaller, more fuel efficient vehicles (neutral life-cycle cost)	104	\$40,000 fuel savings
Purchase six new Hybrid-electric transit buses (\$1.3 million)	74	\$26,000 fuel savings
New Solar PV installations (\$3.4 million)	45	\$178,000 FIT revenue
Reduction in Employee Business Travel (Travelwise program budget + Corporate Sustainability Fund)	24	\$7,000 saved in mileage reimbursement
<b>Annualized Totals</b>	<b>26,345 Tonnes</b>	<b>Savings: \$385,000</b> <b>Revenue: \$178,000</b>

In terms of LEED buildings, these types of initiatives help reduce emissions from the forecasted levels as they would otherwise be consuming from 25-50% more energy than facilities built to standard building code. The reductions from these buildings compared to the forecast will appear in future emission inventory reports. Several major actions are in progress or are planned for implementation during the 2013-2019 period some of which are summarized in Table 4.

Recently, Regional Council approved the use of a portion of the solar PV revenue from the Feed-in-Tariff program which will provide additional financial resources towards projects that will further reduce electricity and natural gas consumption within facilities. This reinvestment of resources will further reduce GHGs from operations as well as compound the impact of the Corporate Energy Office’s efforts to an estimated over \$6.2 million in additional savings and cost avoidance over 20 years. In

additional to financial savings, other benefits associated with implementation of actions identified to date include reduced emission of air pollutants from Regional fleet/transit tail-pipe emissions (e.g. smog precursors), optimization of assets in terms of their overall operational performance, improved services along with contributing to the further development of the green economy.

**Table 4. Status and Impact of Major Projects for Implementation 2013 - 2019**

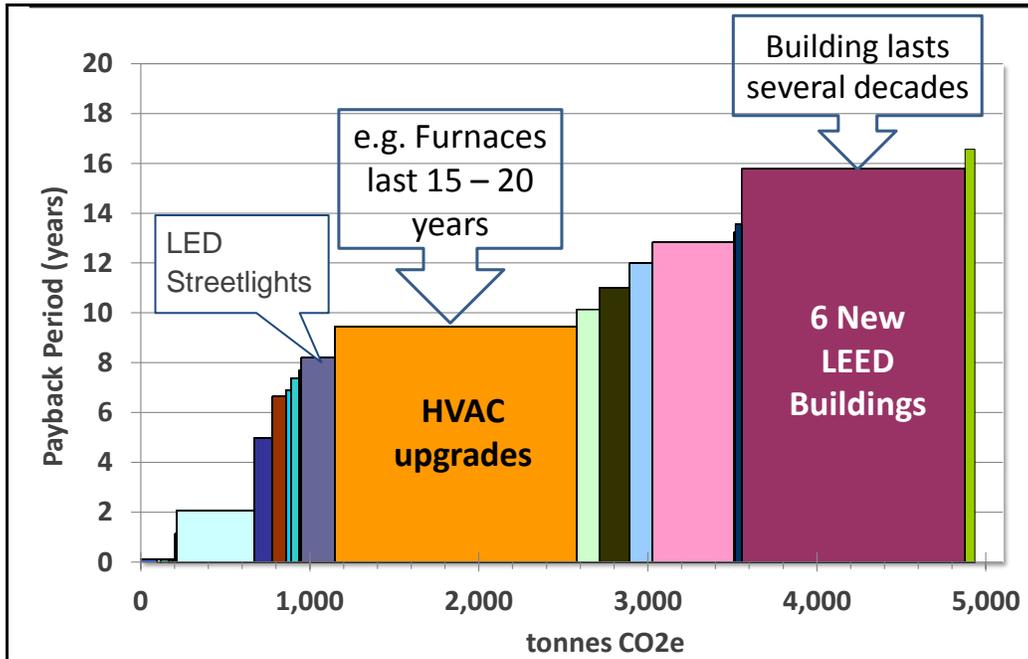
Action	Status	Annual GHGs Reduced (T)	Estimated Cost	Annual \$ Savings	Lead Division
<b>Buildings and Streetlights</b>					
7 New LEED buildings	In-progress (50% complete)	1800	\$5.5 million (incremental)	\$635,000	Various/Facilities
Replace Streetlights with LED	Pilot in-progress	220	\$4.1 million	\$806,000 <sup>a</sup>	Roads
Planned furnace replacements in Regional housing units	In-progress	200	No incremental cost	\$25,000	Facilities/Housing
Energy efficiency projects <sup>b</sup>	In-progress	165	\$835,000	\$105,000	Facilities
<b>Waste/Biosolids</b>					
Projected impact of reduction of landfill gas at year 2019 (green bin, portable flaring)	In-progress	12000	(embedded in divisional operations budgets)	NA	Waste Management
Projected impact of changes in Wastewater/Biosolids operations at year 2019	In-progress	8815		NA	Water Services
<b>Fleet</b>					
Biodiesel in transit buses - B5 / B20 (winter/summer)	Under Consideration	2580	\$80,000 per year	NA	GRT
Idling reduction / telematics	Pilot in-progress	1200	\$1.05 million	\$450,000	Fleet Services, Transit, EMS
Green Fleet procurement and central fleet pool	In-progress	250	\$1.25 million	To be determined	Various / Fleet Services

Note a): Includes annualized avoided capital cost as LED streetlights last 3-4 times as long as current lighting.

b) These energy projects are for the years 2013 – 2014 only. The Energy Conservation Plan required under the provincial Green Energy Act by 2014 will address projects for years 2015 – 2019 corporate-wide.

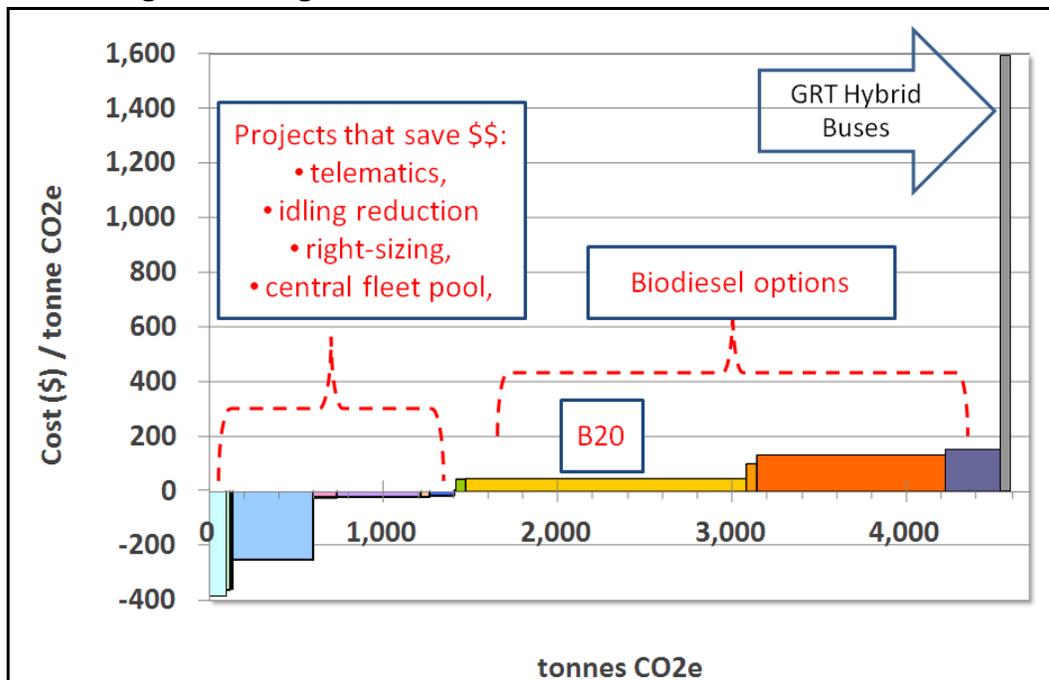
Payback periods vary among different actions and are assessed in relation to their useful life as an asset. This is illustrated in Figure 2 with the example of furnaces in Regional housing units and the extra expense for constructing new buildings to LEED Silver or Gold building standards. Installing LED Streetlights is another example where a ramped-in payback of approximately 8 years is expected with incentives from the local electrical utilities whereas the expected lamp life is up to 12 - 15 years. Including the avoided capital replacement cost, the payback for streetlights is reduced to 5 years.

**Figure 2. Payback Periods of Sample Actions in Relation to Asset Life**



Similarly, the cost per tonne of GHGs reduced has been examined to identify the projects that optimize the use of resources. Figure 3 illustrates this with examples from the list of fleet actions where some initiatives will save money in avoided fuel costs, some will provide large GHG reductions with little investment such as use of biodiesel fuel where as others may be implemented for higher profile such as the purchase of hybrid transit buses.

**Figure 3. Marginal Abatement Cost Curves of Fleet Initiatives**

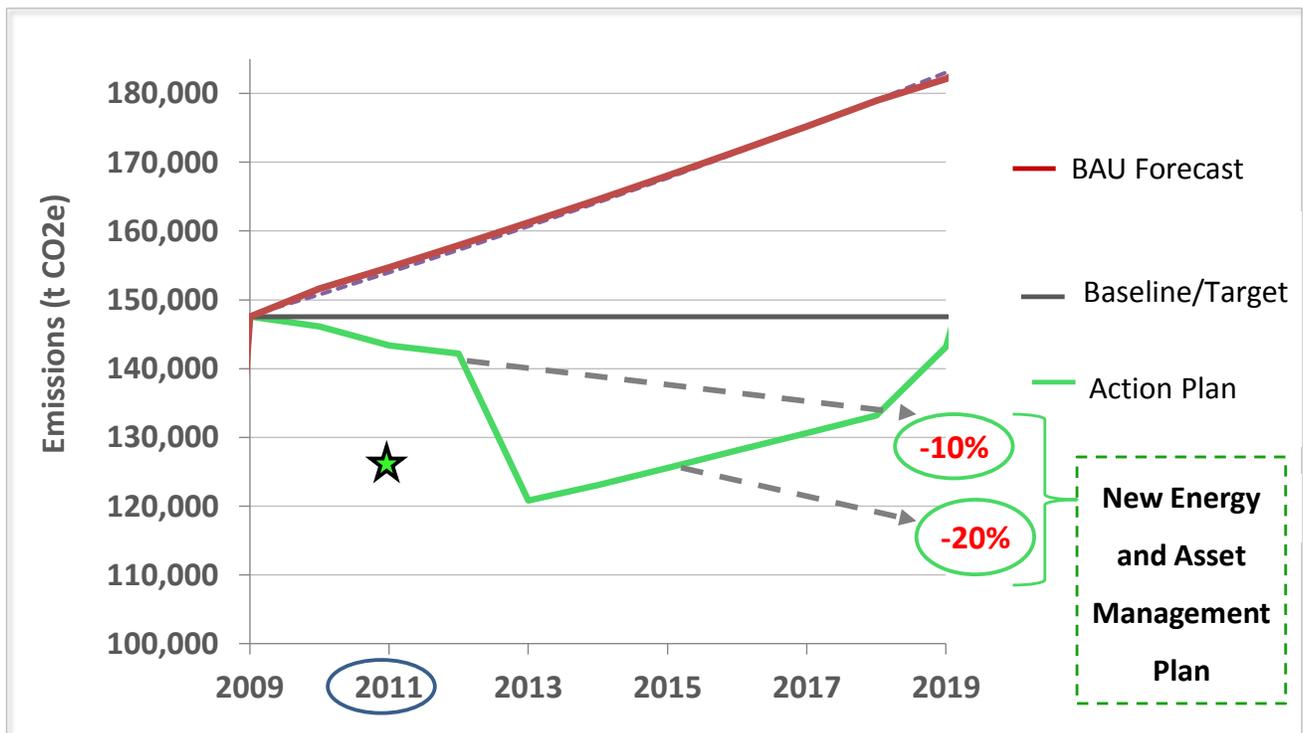


## GHG REDUCTION TARGETS REVISITED

With the improved approach for calculating the Region’s emissions, it is anticipated that the overall impact of implementing the current Corporate GHG Action Plan will reduce emissions approximately 5% below the 2009 levels. Various alternative absolute GHG reduction targets were considered and examined by the Region’s Sustainability Office and Environmental Leadership Committee ranging from 5% – 20% below the base year emissions.

Significant enhancements to the current action plan from 2015 onward are expected as part of the Region’s Energy Conservation Plan and Asset Management process currently in development. Given that almost a 15% reduction in the Region’s 2011 corporate GHG emissions has already been achieved along with the expected impact of implementing new actions and lower forecasted emissions, **it is recommended that a more aggressive GHG target be established at 10% absolute reduction below 2009 emission levels translating to a 24% per capita (intensity-based) reduction by the year 2019.** Substantial growth in energy use in both facilities and fleet is still expected during the 2014 – 2018 period and therefore a 20% absolute reduction is not likely achievable. Figure 4 and Table 5 illustrate the details of the proposed target in relation to forecasted and current emissions.

**Figure 4. RoW GHGs in Relation to Forecasted Emissions and Proposed Reduction Target**



Pending Regional Councils’ approval of the recommended target, Bronze Pledging Partner status would be achieved with Sustainable Waterloo Region based on the intensity-based target.

**Table 5. GHG Reduction Targets in Absolute and Per Capita Intensity Values**

Forecasted emissions in 2019 = 180,143 Tonnes (T) CO <sub>2</sub> e or 0.29 Per Capita					
Year	Population	Absolute Target	Emissions T CO <sub>2</sub> e	T CO <sub>2</sub> e per Capita levels If Target Met (rounded)	% Reduction / Capita (compared to 2009)
2009	534,900	--	147,743	0.28 emissions per capita (2009)	--
<i>Current target: maintain 2009 emission levels thru to 2019 (i.e. 0% reduction from base year is equates to a decrease of 32,400 T CO<sub>2</sub>e equivalent to the forecasted growth in emissions by 2019)</i>					
2019	631,777	0%	147,743	0.23	15%
2019	631,777	-10%	132,969	0.21	24%
2019	631,777	-20%	118,194	0.19	32%

## IMPLEMENTATION, MONITORING AND REPORTING

There are currently 3 major strategic initiatives where implementation of these actions are integrated as follows:

- Corporate-wide Energy Planning as part of compliance with the Ontario Green Energy Act
- Asset Management (optimizing life-cycle of Regional fleet, facilities, equipment)
- Infrastructure Master Plan reviews (optimization of fulfilling future demand)

It is from these major initiatives where the need and support for improvements in operations will be identified from which GHG reductions and other financial and service benefits can be realized.

Annual updates on the status of implementing specific actions are provided to the Region's Environmental Leadership Committee (comprised of senior management from all seven departments), Regional Council and the Sustainable Waterloo Regional Carbon Initiative. Complete assessment of corporate-wide GHG emissions (i.e. updated emissions inventory) is planned every two years in order to monitor progress towards the reduction target. These more comprehensive inventory reports will be made available to the public and sent to FCM under the Region's commitment to the PCP program. Departments with authority of specific assets will be responsible for implementation with assistance from the Sustainability Office which also maintains a database of actions and corporate emissions.

Summary Progress Report: Region of Waterloo Corporate GHG Inventory and Action Plan

**Annex A. Specific Revisions to RoW Corporate 2009 Base Year GHG Emissions Inventory**

Revised 2009	Reason for Change	Calculation change		Tonnes CO2e		Total Impact (T CO2e)	
		old	revised	old	revised		
Revised Electricity EF (T/MWh)	Used updated 2009 EF from Env. Can. (used 2008 EF in original doc - 17 month time lag for published EF)	0.17	0.12	24,653	17,402	-7,251	
Recalculated Solid Waste: now includes updated landfill gas collection efficiencies (CE), updated biosolids GHG assessment)	Detailed Stantec study identifies CE based on measured closed + capped portion of landfill vs. Daily cover + open portions for Waterloo/Cambridge landfills)	75%/85%	74.9/95%	69,615	64,428	-5,187	
Recalculated CO2e (BEAM) emissions from Biosolids/Wastewater treatment and discharge (excluding landfilled cake)	BEAM modeling conducted in-house easier to maintain and update each year to monitor progress	(see supporting BEAM spreadsheet)		609	14,020	13,411	
Eliminated staff commute	Only Employee Business Travel accurately accounted	NA		565	550	-15	
Eliminated est. fuel used in Generators	Low data confidence/de minimis source	NA		12	0	-12	
Eliminated Bio-treatment of solid waste	Green bin, leaf and yard waste are biogenic GHG	NA		1122	0	-1122	
Eliminated "Other (e.g. Refrigerants in chillers/AC)	de minimis source (not routinely calculated)	NA		194	0	-194	
Eliminated propane use	de minimis source	NA		27	0	-27	
				<b>Sub-Total</b>	96,797	96,400	<b>-397</b>
	<b>No change</b>						
	Fleet			36,244	36,244	<b>0</b>	
	Stationary Natural gas consumption (except exclusion of propane)			15,099	15,099	<b>0</b>	
				<b>Totals</b>	<b>148,140</b>	<b>147,743</b>	<b>-397</b>

Total eliminated as de minimis	-233	-0.16%
Total eliminated as biogenic emissions	-1122	-0.76%
Total revised from more accurate and updated calculations	958	0.65%
	<b>- 397</b>	<b>-0.27%</b>